



Faculty Member Profile

Mark G. Carter

Ph.D.

Assistant Research Professor

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Background:

Born and raised in Bangor, Maine, Dr. Carter's first research experience was as a Student Researcher at The Jackson Laboratory in Bar Harbor, working with Drs. Jane Barker and Janan Eppig on chromosomal abnormalities in mouse models of disease. After receiving a Bachelor's degree in Biology and Environmental Studies from Tufts University in Medford, MA, he worked as a Clinical Laboratory Technician at Brigham & Women's hospital. Dr. Carter went on to earn a Ph.D. degree in Human Genetics and Molecular Biology from The Johns Hopkins University, studying an epigenetically silenced tumor suppressor gene in the laboratory of Dr. Stephen Baylin. Following his graduate work, Dr. Carter remained in Baltimore to do post-doctoral work in Developmental Genomics with Dr. Minoru Ko at the National Institute on Aging. Dr. Carter joined the faculty of Animal Science and the Center for Regenerative Biology at The University of Connecticut in 2006.

Awards Recieved :

- NIH Training Grant Fellowship for Predoctoral Studies, The Johns Hopkins University, Baltimore, MD. (1994)
- Intramural Research Training Award, National Institute on Aging, Baltimore, MD. (2000)
- Pharmacology Research and Training Program Fellowship, NIGMS, NIH, Bethesda, MD. (2001)
- Intramural Research Program "On-the-Spot" Award, National Institute on Aging, Baltimore, MD. (2004)

Research Interests:

Despite the dramatic advances made in genome science over the last two decades, our collective understanding of gene function and regulation in the developing mammalian embryo

is rudimentary at best. Tremendous progress has also been made in understanding transcript splicing, chromatin structure dynamics, and epigenetic gene regulation, but how these individual aspects of genome function work together to produce the unimaginably complex phenomenon of development is largely unknown. Understanding the mechanisms involved will certainly be relevant to clinical efforts to understand, prevent, and treat birth defects and infertility in patients, but it could also shed light on fundamental biological questions of how embryos of different species can use roughly the same gene content and similar developmental programs to produce animals with very different characteristics and neurological complexity. Furthermore, studying the differences and similarities in genome function between embryos, embryonic stem cells, and their differentiated derivatives will advance the emerging field of Regenerative Medicine.

My current research goal is to combine my experience and interest in developmental genomics with recent advances in the study of epigenetics to integrate gene expression network data with information on chromatin state in preimplantation mammalian embryos. By contributing my experience in embryonic and stem cell gene expression profiling to the unique nuclear transfer cloning abilities of Dr. Yang's group in mice and cattle, we hope to understand more about the connections between gene expression and epigenetic chromatin modification in normal and cloned embryos, as well as in pluripotent and differentiated embryonic stem cells derived from such embryos.

Recent Publications:

Peer-Reviewed Papers

Matoba R, Niwa H, Masui S, Ohtsuka S, Carter MG, Sharov AA, Ko MS. Dissecting oct3/4-regulated gene networks in embryonic stem cells by expression profiling. *PLoS ONE*. 2006 Dec 20;1(1):e26. PMID: [17183653](#)

Aiba K, Sharov AA, **Carter MG**, Feroni C, Vescovi AL, Ko, MS. Defining a developmental path to neural fate by global expression profiling of mouse embryonic stem cells and adult neural stem/progenitor cells. *Stem Cells*. 2006 Apr;24(4):889-95. Epub 2005 Dec 15. PMID: [16357342](#)

Das B, Cai L, **Carter MG**, Piao Y, Sharov AA, Ko MS, Brown, DD. Gene Expression Changes at Metamorphosis Induced by Thyroid Hormone in *Xenopus laevis* Tadpoles. *Dev Biol*. 2006 Mar 15;291(2):342-55. Epub 2006 Feb 3. PMID: [16458881](#)

Yoshikawa T, Piao Y, Zhong J, Matoba R, **Carter MG**, Wang Y, Goldberg I, Ko MS. High-throughput screen for genes predominantly expressed in the ICM of mouse blastocysts by whole mount in situ hybridization. *Gene Expr. Patterns*. 2006 Jan 6;6(2):213-24. Epub 2005 Dec 1. PMID: [16325481](#)

Carter MG, Sharov AA, VanBuren V, Dudekula DB, Carmack CE, Nelson C, Ko MS. Transcript copy number estimation using a mouse whole-genome oligonucleotide microarray. *Genome Biol*. 2005 Jun 30;6(7):R61. Epub 2005 Jun 30. PMID: [15998450](#)

Sakatani T, Kaneda A, Iacobuzio-Donahue CA, **Carter MG**, Witzel SD, Okano H, Ko MS, Ohlsson R, Longo DL, Feinberg AP. Loss of Imprinting of *Igf2* Alters Intestinal Maturation and

Tumorigenesis in Mice. *Science*. 2005 Mar 25;307(5717):1976-8. Epub 2005 Feb 24. PMID: [15731405](#)

Hamatani T, Falco G, **Carter MG**, Akutsu H, Stagg CA, Sharov AA, Dudekula DB, VanBuren V, Ko MS. Age-associated alteration of gene expression patterns in mouse oocytes. *Hum Mol Genet*. 2004 Oct 1;13(19):2263-78. Epub 2004 Aug 18. PMID: [15317747](#)

Hamatani T, Daikoku T, Wang H, Matsumoto H, **Carter MG**, Ko MS, Dey SK. Global gene expression analysis identifies molecular pathways distinguishing blastocyst dormancy and activation. *Proc Natl Acad Sci U S A*. 2004 Jul 13;101(28):10326-31. Epub 2004 Jul 1. PMID: [15232000](#)

Hamatani T, **Carter MG**, Sharov AA, Ko MS. Dynamics of global gene expression changes during mouse preimplantation development. *Dev Cell*. 2004 Jan;6(1):117-31. PMID: [14723852](#)

Sharov AA, Piao Y, Matoba R, Dudekula DB, Qian Y, VanBuren V, Falco G, Martin PR, Stagg CA, Bassey UC, Wang Y, **Carter MG**, Hamatani T, Aiba K, Akutsu H, Sharova L, Tanaka TS, Kimber WL, Yoshikawa T, Jaradat SA, Pantano S, Nagaraja R, Boheler KR, Taub D, Hodes RJ, Longo DL, Schlessinger D, Keller J, Klotz E, Kelsoe G, Umezawa A, Vescovi AL, Rossant J, Kunath T, Hogan BL, Curci A, D'Urso M, Kelso J, Hide W, Ko MS. Transcriptome analysis of mouse stem cells and early embryos. *PLoS Biol*. 2003 Dec;1(3):E74. Epub 2003 Dec 22. PMID: [14691545](#)

Carter MG, Piao Y, Dudekula DB, Qian Y, VanBuren V, Sharov AA, Tanaka TS, Martin PR, Bassey UC, Stagg CA, Aiba K, Hamatani T, Matoba R, Kargul GJ, Ko MS. The NIA cDNA project in mouse stem cells and early embryos. *C R Biol*. 2003 Oct-Nov;326(10-11):931-40. PMID: [14744099](#)

Carter MG, Hamatani T, Sharov AA, Carmack CE, Qian Y, Aiba K, Ko NT, Dudekula DB, Brzoska PM, Hwang SS, Ko MS. *In situ*-synthesized novel microarray optimized for mouse stem cell and early developmental expression profiling. *Genome Res*. 2003 May;13(5):1011-21. PMID: [12727912](#)

Chen WY, Zeng X, **Carter MG**, Morrell CN, Chiu Yen RW, Esteller M, Watkins DN, Herman JG, Mankowski JL, Baylin SB. Heterozygous disruption of *Hic1* predisposes mice to a gender-dependent spectrum of malignant tumors. *Nat Genet*. 2003 Feb;33(2):197-202. Epub 2003 Jan 21. PMID: [12539045](#)

VanBuren V, Piao Y, Dudekula DB, Qian Y, **Carter MG**, Martin PR, Stagg CA, Bassey UC, Aiba K, Hamatani T, Kargul GJ, Luo AG, Kelso J, Hide W, Ko MS. Assembly, verification, and initial annotation of the NIA mouse 7.4K cDNA clone set. *Genome Res*. 2002 Dec;12(12):1999-2003. PMID: [12466305](#)

Kargul GJ, Dudekula DB, Qian Y, Lim MK, Jaradat SA, Tanaka TS, **Carter MG**, Ko MS. Verification and initial annotation of the NIA mouse 15K cDNA clone set. *Nat Genet*. 2001 May;28(1):17-8. PMID: [11326268](#)

Carter MG, Johns MA, Zeng X, Zhou L, Zink MC, Mankowski JL, Donovan DM, Baylin SB. Mice deficient in the candidate tumor suppressor gene *Hic1* exhibit developmental defects of structures affected in the Miller-Dieker syndrome. *Hum Mol Genet*. 2000 Feb 12;9(3):413-9.

PMID: [10655551](#)

Reviews and Book Sections

Aiba K, **Carter MG**, Matoba R, and MSH Ko. Genomic approaches to early embryogenesis and stem cell biology. *Semin Reprod Med.* 2006 Nov;24(5):330-9. PMID [17123228](#)

Tanaka TS, **Carter MG**, Aiba K, Jaradat SA, and MSH Ko. Genomic approaches to stem cell biology in *Human Pluripotent Stem Cells*. Editor, Jon S. Odorico. Garland Science/BIOS Scientific Publishers, New York. 2005.

Hobbies or Non-Academic Interests:

I have been playing the violoncello since grade school, performing in chamber ensembles and orchestras, including the [Bangor Symphony Orchestra](#) and the [Longwood Symphony](#) at New England Conservatory's Extension School. I took up distance running in 2005, completing the [Frederick](#), [Baltimore](#), and [Hartford](#) Marathons in the past two years.

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